

## ABSTRACT OF THE DISCLOSURE

A motion control system and method that includes a central controller configured to generate first and second demand control signals to be used to define actuation motion of respective first and second actuators. The central controller is in communication with first and second nodes by way of a data network, each node including at least a respective actuator configured to implement at an actuator time a motion or force-related effort based upon the respective demand control signal. Each node also includes a memory configured to store at least one respective propagation delay parameter related to a signal propagation delay between the central controller and the node. A timing mechanism establishes timing at each node based on the respective propagation delay parameter so that the actuator time at the nodes occurs simultaneously. Strictly cyclic and/or full-duplex high-speed communication can be supported. The network can be wired in a ring or as a tree and with twisted pair cabling or fiber. The central controller issues demand signals to the nodes that are actuator, servo motor drive, and/or I/O devices. The central controller can also provide a timing message that is used by the nodes, in conjunction with local delay correction circuitry, so that the simultaneous acquisition of data and the simultaneous implementation of controlled action occur.